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AF/2878/$

ATTORNEY DOCKET NO. 10010314-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Izhak Baharav, et al.

Serial No.: 10/086,125 **Examiner:** Stephen K. Yam

Filing Date: February 27, 2002 **Group Art Unit:** 2878

Title: TWO-COLOR PHOTO DETECTOR AND METHODS FOR DEMOSAICING A TWO-COLOR PHOTO-DETECTOR ARRAY

COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Sir:

Transmitted herewith in ***triplicate*** is the Appeal Brief in this application with respect to the Notice of Appeal filed on February 20, 2004.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) **$330.00**.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)(1)-(5)) for the total number of months checked below:

☐	one month	$ 110.00
☐	two months	$ 420.00
☐	three months	$ 950.00
☐	four months	$1480.00

☐ The extension fee has already been filled in this application.

☒ (b) Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account **50-1078** the sum of **$330.00**. At any time during the pendency of this application, please charge any fees required or credit any overpayment to Deposit Account **50-1078** pursuant to 37 CFR 1.25.

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Signature: Laura Zavala

Respectfully submitted,
Izhak Baharav, et al.

By _____
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Date: April 6, 2004

Telephone No. 972-628-3600

DOCKET NO.: 10010314-1 **PATENT**
CLIENT NO.: AGIL01-00148

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Application of:

IZHAK BAHARAV et al.

Serial No. 10/086,125

Filed: February 27, 2002

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Group Art Unit: 2878

For: TWO-COLOR PHOTO DETECTOR AND METHODS FOR DEMOSAICING A TWO-COLOR PHOTO-DETECTOR ARRAY

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Signature: Laura Zavala
LAURA ZAVALA

Dear Sir:

APPEAL BRIEF

The Appellants have appealed to the Board of Patent Appeals and Interferences from the decision of the Examiner dated November 26, 2003, finally rejecting Claims 1-9, 11-19, 27 and 28. The Appellants filed a Notice of Appeal on February 20, 2004. The Appellants respectfully submit this brief on appeal, in triplicate, with a statutory fee of $330.00.

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REAL PARTY IN INTEREST

This application is currently owned by Agilent Technologies, Inc.

RELATED APPEALS AND INTERFERENCES

There are no known appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in this pending appeal.

STATUS OF CLAIMS

Claims 10 and 20-26 have been canceled from the above-identified patent application. Claims 1-9, 11-19 and 27-28 remain pending in the above-identified patent application. Claims 1-9, 11-19 and 27-28 and 13-16 have been rejected. Claims 1-9, 11-19 and 27-28 are presented for appeal. Claims 1-9, 11-19 and 27-28 are shown in Appendix A.

STATUS OF AMENDMENTS

The Appellants submitted a RESPONSE TO FINAL OFFICE ACTION on January 8, 2004. The RESPONSE TO FINAL OFFICE ACTION amended Claim 11 to correct a typographical error. The Examiner entered the amendment for purposes of appeal.

SUMMARY OF INVENTION

According to one embodiment, a digital image sensor, shown in Figures 1 and 2, is provided with a first two-color photo-detector 5 sensitive to a first total wavelength range and a second two-color photo-detector 5 sensitive to a second total wavelength range different from the first total wavelength range. (*Application, Page 8, Lines 1-10*). The first two-color photo-detector 5 includes a first photo-detector element 12 capable of absorbing light within a first range of wavelengths of the first total wavelength range and a second photo-detector element 13 capable of absorbing light within a second range of wavelengths of the first total wavelength range. (*Application, Page 8, Lines 1-10*). The first photo-detector element 12 is in an elevated relation with and electrically isolated from the second photo-detector element 13. (*Application, Page 9, Lines 2-5; Page 10, Line 21 – Page 11, Line 4*). In addition, the second two-color photo-detector 5 includes a third photo-detector element 21 in an elevated relation with and electrically isolated from a fourth photo-detector element 22. (*Application, Page 9, Lines 2-5; Page 10, Line 21 – Page 11, Line 4*).

In further embodiments, a dielectric layer 50 resides between the first photo-detector element 12 and the second photo-detector element 13 to provide electrical isolation between the first photo-detector element 12 and the second photo-detector element. In addition, a dielectric layer 50 resides between the third photo-detector element 21 and the fourth photo-detector element 22 to provide electrical isolation between the third photo-detector element 21 and the

fourth photo-detector element 22. (*Application, Page10, Line 21 – Page 11, Line4*). In still further embodiments, a first color filter 30 is provided in an elevated relation with the first photo-detector element 12 for absorbing light within a third range of wavelengths and passing light within the first and second ranges of wavelengths. In addition, a second color filter 30 is provided in an elevated relation with the third photo-detector element 21 for absorbing light within either the first or second range of wavelengths, passing light within the third range of wavelengths and passing light within the non-absorbed one of the first or second ranges of wavelengths. (*Application, Page 10, Lines 3-18*).

STATEMENT OF ISSUES

(1) Whether Claims 14-19 and 28 are anticipated under 35 U.S.C. § 102(b) by U.S. Patent No. 4,677,289 to Nozaki et al. ("*Nozaki*"); and

(2) Whether Claims 1-9, 11-13 and 27 are unpatentable under 35 U.S.C. § 103(a) over *Nozaki* in view of UK Patent Application No. 2,166,289 to Yokota et al. ("*Yokota*").

GROUPING OF CLAIMS

Pursuant to 37 C.F.R. § 1.192(c)(7), the Appellants request that the claims be grouped as follows:

Group A: Claims 14-16, 19 and 28;

Group B: Claims 1-6, 9 and 27

Group C: Claims 7, 8 and 11

Group D: Claims 17 and 18; and

Group E: Claims 12 and 13.

Groups A, B, C, D and E stand or fall independently.

ARGUMENTS

I. GROUP A

A. OVERVIEW

Claims 14-16, 19 and 28 stand rejected under 35 U.S.C. § 102(b) as being anticipated by *Nozaki*.

B. STANDARD

A cited prior art reference anticipates the claimed invention under 35 U.S.C. § 102 only if every element of a claimed invention is identically shown in that single reference, arranged as they are in the claims. MPEP § 2131; *In re Bond*, 910 F.2d 831, 832, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990). Anticipation is only shown where each and every limitation of the claimed invention is found in a single cited prior art reference. MPEP § 2131; *In re Donohue*, 766 F.2d 531, 534, 226 U.S.P.Q. 619, 621 (Fed. Cir. 1985).

C. THE *NOZAKI* REFERENCE

Nozaki recites a color sensor having a plurality of photovoltaic cells each having a different photosensing wavelength. (*Abstract*). The object of *Nozaki* is to provide a color sensor that can sense color components without the need of using various color filters. (*Col. 1, Lines 37-40 and Lines 57-60*). This object is achieved by stacking the photovoltaic cells one over another, and electrically connecting the photovoltaic cells in series. (*Col. 1, Lines 47-51 and Lines 64-67*).

The structural model of the color sensor is shown in FIG. 2A. A transparent conductive layer 28 (e.g., ITO) is formed on a photodiode 26IR, and a PIN photodiode 30V is formed above the transparent conductive layer 28. Photodiode 26IR senses primarily red colored light, while PIN photodiode 30V senses visible light. (*Col. 7, Lines 20-43*). The structure is expanded in FIG. 4 to include four photodiodes 42B, 42G, 42R and 42IR, each for sensing a different wavelength. Photodiodes 42B, 42G, 42R and 42IR are stacked one over another, separated by transparent conductive layers 44B, 44G, 44R and 44IR. Transparent conductive layers 44B, 44G, 44R and 44IR serve as connection terminals for series-connecting photodiodes 42B, 42G, 42R and 42IR. (*Col. 8, Lines 21-46*). An IR filter 46 is shown in FIG. 4 to prevent photocurrent from being produced in the infrared photodiode 42IR. In addition, an intensity (neutral density) filter 50 is also shown in FIG. 4 to control the amount of incident light.

D. CLAIMS 14-16, 19 AND 28

The Examiner has not shown that *Nozaki* teaches all of the elements of Claim 14. Specifically, Appellants respectfully submit that *Nozaki* does not teach (expressly or inherently) at least the following features recited in Claim 14:

(1) "*a first dielectric layer between said first photo-detector element and said second photo-detector element*;" and

(2) "*a second dielectric layer between said third photo-detector element and said fourth photo-detector element.*"

On Pages 2-3 of the Final Office Action of November 26, 2003 (Paper No. 1103), the Examiner contended that the "first dielectric layer" in Claim 14 is taught by layer 44G of *Nozaki*, and "the second dielectric layer" in Claim 14 is taught by layer 44IR of *Nozaki*. However, layers 44G and 44IR of *Nozaki* are described on col. 8, lines 35-41 as "transparent conductive layers and serve both as connection terminals for series-connecting photodiodes, and also as layers for transmitting the incident light to the underlying photodiodes." Appellants respectfully submit that a dielectric material is a substance that is a poor conductor of electricity. Thus, conductive layers that serve to electrically-series connect photodiodes cannot be said to teach dielectric layers.

For these reasons, the Examiner has not shown that *Nozaki* teaches the Appellants' invention as recited in Claim 14. As a result, Claim 14 (and its dependents) are allowable over the art of record. Accordingly, Appellants respectfully request the withdrawal of the § 102 rejection and full allowance of Claims 14-19 and 28.

II. GROUP B

A. OVERVIEW

Claims 1-6, 9 and 27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Nozaki* in view of *Yokota*.

B. STANDARD

A *prima facie* case of obviousness is established when the teachings of the prior art itself suggest the claimed subject matter to a person of ordinary skill in the art. *In re Bell*, 991 F.2d 781, 783, 26 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1993). To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed invention and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. MPEP § 2142.

When a proposed modification or combination of the prior art would render the prior art invention unsatisfactory for its intended purpose or change the principle of operation of the prior art invention, there is no suggestion or motivation to make the proposed modification. As a result, the teachings of the references are not sufficient to render the claims *prima facie* obvious. MPEP § 2143.01.

C. THE *YOKOTA* REFERENCE

Yokota recites a color sensor including two photovoltaic elements, each having a different frequency response. (*Abstract*). The object of *Yokota* is to provide a color sensor that dispenses with the need for a specific color filter and can be produced by a simple manufacturing process. (*Page 1, Lines 104-109*). This object is achieved using stacked amorphous photovoltaic elements of different thicknesses, separated by an insulating layer. (*Page 2, Lines 6-16 and Lines 93-128*).

D. CLAIMS 1-6, 9 AND 27

1. Claim1: *"said first photo-detector element being electrically isolated from said second photo-detector element"*

The Examiner has not shown that the proposed *Nozaki-Yokota* combination discloses, teaches or suggests at least the following feature recited in Claim 1: "*said first photo-detector element being electrically isolated from said second photo-detector element.*" Although *Yokota* does teach an insulating layer, modifying the *Nozaki* color sensor to electrically isolate the photodiodes from each other, as taught by *Yokota*, would change the principle of operation of the *Nozaki* color sensor, which requires the photodiodes be connected in series (*Col. 1, Lines 47-60*).

The *Nozaki* color sensor operates using "a plurality of photovoltaic cells, each having a different photosensing wavelength area and being electrically connected in series; a connection line electrically connected between both terminals of the cell group to form a closed circuit, and a sensing circuit for detecting a voltage across each photovoltaic cell and for evaluating color components of light incident on the color sensor... without the need of providing various color filters at the light receiving side." (*Col. 1, Lines 47-60*). The operation principle is further described in the circuit of Figure 1, showing electrically, serially-connected photodiodes, and in the structural models of Figures 2A, 2B, 4, 5 and 7, showing transparent conductive layers between photodiodes to electrically connect the photodiodes in series.

Thus, there is no motivation or suggestion to modify *Nozaki*, as the Examiner suggests, to electrically isolate the top photo-detector element from the bottom photo-detector element. As a result, the Examiner has not established a prima facie case of obviousness against Claims 1-6, 9 and 27.

2. **Claim 1:** "*a second two-color photodetector ... sensitive to a second total wavelength range different from said first total wavelength range*"

The Examiner has not shown that the proposed *Nozaki-Yokota* combination discloses, teaches or suggests at least the following additional feature recited in Claim 1: "*a second two-color photodetector ... sensitive to a second total wavelength range different from said first total wavelength range.*" Both *Nozaki* and *Yokota* recite a color sensor including stacked amorphous photovoltaic elements for sensing different wavelengths. However, neither *Nozaki* nor *Yokota* recite multiple color sensors, each being sensitive to a different wavelength range, as claimed in Claim 1 of the present application.

In addition, one of the objects of *Nozaki* is as follows: "since respective photodiodes are stacked one over another, it is possible to identify the color components of light incident on a small area, i.e., one kind of photosensing area when viewed in a planar plane." (*Col. 1, Lines 64-68*) Therefore, modifying *Nozaki* to include a second two-color photo-detector that is sensitive to a second total wavelength range different from a first total wavelength range that a first two-color photo-detector is sensitive to, as claimed in Claim 1, would render *Nozaki* unsatisfactory for its intended purpose. Thus, there is no motivation to combine *Nozaki* and *Yokota* to provide a second two-color photo-detector sensitive to a second total wavelength range different from the first total wavelength range, as recited in Claim 1.

For these reasons, the Examiner has not shown that the proposed *Nozaki-Yokota* combination discloses, teaches or suggest the Appellants' invention as recited in Claim 1. As a result, the Examiner has not established a *prima facie* case of obviousness against Claim 1 (and its dependents). Accordingly, Appellants respectfully request the withdrawal of the § 103 rejection and full allowance of Claims 1-9, 11-13 and 27.

III. GROUP C

A. OVERVIEW

Claims 7, 8 and 11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Nozaki* in view of *Yokota*.

B. CLAIMS 7, 8 and 11

The Examiner has not shown that the proposed *Nozaki-Yokota* combination discloses, teaches or suggests at least the following feature recited in Claims 7 and 11: "*a color filter in an elevated relation with said first photo-detector element.*" *Nozaki* teaches an IR filter 46 that prevents photocurrent from being produced in the infrared photodiode 42IR *Yokota* does not teach any type of filter. As a result, Appellant's respectfully submit that an IR filter does not teach the use of a "color filter," as is claimed in Claims 7 and 11. As is known in the art, the term "color" is a property of visible light that is based on the human perception of the visible light portion of the electromagnetic spectrum. By contrast, the term "infrared" refers to the IR portion of the electromagnetic spectrum, which is invisible to the human eye, and therefore does not fall within the gamut of "color."

In addition, on Page 8 of the Final Office Action of November 26, 2003 (Paper No. 1103), the Examiner remarked: "a 'color filter' is a general term describing the filtering of electromagnetic wavelengths of light and is not limited to the visible spectrum. ... Hence, the filter of Nozaki et al. is a color filter even though it is an IR filter."

Appellants respectfully submit that regardless of the Examiner's position, *Nozaki* clearly teaches that a color filter is different from an IR filter. For example, *Nozaki* specifically states: "One object of the invention is to provide a color sensor ... without the need of using various

color filters." (*Col. 1, Lines 36-40; Col. 1, Lines 57-60*). Thus, it is apparent that the teachings of *Nozaki* recognize a difference between color filters and IR filters, and *Nozaki* expressly excludes color filters. Therefore, the IR filter in *Nozaki* cannot be interpreted to include "color filters," since such an interpretation would be contrary to the teachings of *Nozaki*. As a result, *Nozaki* does not teach a "color filter," as claimed in Claims 7, 11 and 17.

In addition, *Yokota* specifically states: "it is an object of the invention... to provide a color sensor which ... dispenses with the need for a specific color filter." (*Page 1, Lines 104-109*). Thus, *Yokota* does not correct the deficiencies of *Nozaki* and further teaches away from Appellants invention as recited in Claims 7, 11 and 17.

For these reasons, the Examiner has not shown that the proposed *Nozaki-Yokota* combination discloses, teaches or suggests the Appellants' invention as recited in Claims 7 and 11. In addition, as stated above, the Examiner has not provided any motivation to combine *Nozaki* with *Yokota* since the proposed *Nozaki-Yokota* combination would render *Nozaki* unsatisfactory for its intended purpose. As a result, the Examiner has not established a *prima facie* case of obviousness against Claims 7, 8 and 11. Accordingly, Appellants respectfully request the withdrawal of the § 103 rejection and full allowance of Claims 7, 8 and 11.

IV. GROUP D

A. OVERVIEW

Claims 17 and 18 stand rejected under 35 U.S.C. § 102(b) as being anticipated by *Nozaki*.

B. CLAIMS 17 AND 18

The Examiner has not shown that *Nozaki* teaches at least the following feature recited in Claim 17: "*a color filter in an elevated relation with said first photo-detector element.*" As

mentioned above, *Nozaki* teaches an IR filter 46 that prevents photocurrent from being produced in the infrared photodiode 42IR, which does not teach the use of a "color filter," as is claimed in Claims 7 and 11. As is known in the art, the term "color" is a property of visible light that is based on the human perception of the visible light portion of the electromagnetic spectrum. By contrast, the term "infrared" refers to the IR portion of the electromagnetic spectrum, which is invisible to the human eye, and therefore does not fall within the gamut of "color."

In addition, on Page 8 of the Final Office Action of November 26, 2003 (Paper No. 1103), the Examiner remarked: "a 'color filter' is a general term describing the filtering of electromagnetic wavelengths of light and is not limited to the visible spectrum. ... Hence, the filter of Nozaki et al. is a color filter even though it is an IR filter."

Appellants respectfully submit that regardless of the Examiner's position on this issue, *Nozaki* clearly teaches that a color filter is different from an IR filter. For example, *Nozaki* specifically states: "One object of the invention is to provide a color sensor ... without the need of using various color filters." (*Col. 1, Lines 36-40; Col. 1, Lines 57-60*). Thus, it is apparent that the teachings of *Nozaki* recognize a difference between color filters and IR filters, and *Nozaki* expressly excludes color filters. Therefore, the IR filter in *Nozaki* cannot be interpreted to include "color filters," since such an interpretation would be in opposition to the teachings of *Nozaki*. As a result, *Nozaki* does not teach a "color filter," as claimed in Claims 7, 11 and 17.

Furthermore, as stated above, the Examiner has also failed to show where *Nozaki* teaches a dielectric layer, as claimed in Claim 14, from which Claims 17 and 18 depend. For these reasons, the Examiner has not shown that *Nozaki* anticipates Appellants' invention as recited in Claim 17 (and its dependents). Accordingly, Appellants respectfully request the withdrawal of the § 102 rejection and full allowance of Claims 17 and 18.

IV. GROUP E

A. OVERVIEW

Claims 12 and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Nozaki* in view of *Yokota*.

B. CLAIMS 12 AND 13

The Examiner has not shown that the proposed *Nozaki-Yokota* combination discloses, teaches or suggests at least the following feature recited in Claim 12: "*wherein said third photo-detector element is capable of accumulating charge upon reception of light within a third range of wavelengths and said fourth photo-detector element is capable of accumulating charge upon reception of light within a fourth range of wavelengths.*" As mentioned above, both *Nozaki* and *Yokota* recite a color sensor including stacked amorphous photovoltaic elements for sensing different wavelengths. However, neither *Nozaki* nor *Yokota* recite multiple color sensors, each being sensitive to a different wavelength range, as claimed in Claim 1 of the present application.

As also mentioned above, one of the objects of *Nozaki* is as follows: "since respective photodiodes are stacked one over another, it is possible to identify the color components of light incident on a small area, i.e., one kind of photosensing area when viewed in a planar plane." (*Col. 1, Lines 64-68*). Therefore, modifying *Nozaki* to include third and fourth photo-detector elements capable of accumulating charge upon reception of light within third and fourth wavelength ranges would render *Nozaki* unsatisfactory for its intended purpose.

For these reasons, the Examiner has not shown that the proposed *Nozaki-Yokota* combination discloses, teaches or suggests the Appellants' invention as recited in Claim 12.

In addition, as stated above, the Examiner has not provided any motivation to combine *Nozaki* with *Yokota* since the proposed *Nozaki-Yokota* combination would change the principle of operation of *Nozaki*. As a result, the Examiner has not established a *prima facie* case of obviousness against Claim 12 (and its dependents). Accordingly, Appellants respectfully request the withdrawal of the § 103 rejection of Claims 12 and 13.

CONCLUSION

The Appellants have demonstrated that the present invention as claimed is clearly distinguishable over the prior art cited of record. Therefore, the Appellants respectfully request the Board of Patent Appeals and Interferences to reverse the final rejection of the Examiner and instruct the Examiner to issue a notice of allowance of all claims.

Respectfully submitted,

Izhak Baharav et al.

Date: 4/6/04

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APPENDIX A

PENDING CLAIMS

1. (previously presented) A digital image sensor, comprising:

a first two-color photo-detector sensitive to a first total wavelength range, said first two-color photo-detector having a first photo-detector element capable of absorbing light within a first range of wavelengths of said first total wavelength range and a second photo-detector element capable of absorbing light within a second range of wavelengths of said first total wavelength range, said first photo-detector element being in an elevated relation with said second photo-detector element, said first photo-detector element being electrically isolated from said second photo-detector element; and

a second two-color photo-detector having a third photo-detector element in an elevated relation with a fourth photo-detector element, said third photo-detector element being electrically isolated from said fourth photo-detector element, said second two-color photo-detector being sensitive to a second total wavelength range different from said first total wavelength range.

2. (original) The sensor of Claim 1, further comprising:

a substrate, said second photo-detector element being formed within said substrate.

3. (original) The sensor of Claim 2, further comprising:

a dielectric layer between said first photo-detector element and said second photo-detector element, said dielectric layer electrically isolating said first photo-detector element from said second photo-detector element.

4. (original) The sensor of Claim 1, wherein said first photo-detector element is formed of amorphous silicon having a thickness selected to absorb light within said first range of wavelengths and pass light within said second range of wavelengths, said second photo-detector detecting light within said second range of wavelengths passed by said first photo-detector element.

5. (original) The sensor of Claim 1, wherein said first and second photo-detector elements are photodiodes.

6. (original) The sensor of Claim 5, wherein said photodiodes are PIN photodiodes.

7. (original) The sensor of Claim 1, further comprising:

a color filter in an elevated relation with said first photo-detector element, said color filter absorbing light within a third range of wavelengths and passing light within said first and second ranges of wavelengths.

8. (original) The sensor of Claim 7, further comprising:

a transparent metal conductor layer between said color filter and said first photo-detector element.

9. (original) The sensor of Claim 1, further comprising:

circuitry for driving said first photo-detector element and said second photo-detector element, said first photo-detector element being in an elevated relation with said circuitry.

10. (canceled)

11. (currently amended) The sensor of Claim 1, wherein said first two-color photo-detector further comprises a first color filter in an elevated relation with said first photo-detector element of said first two-color photo-detector, said first color filter absorbing light within a third range of wavelengths and passing light within said first and second ranges of wavelengths, said second two-color photo-detector further comprising a second color filter in an elevated relation with said third photo-detector element of said second two-color photo-detector, said second color filter absorbing light within either said first or second ranges of wavelengths, passing light within said third range of wavelengths and passing light within either said first or second ranges of wavelengths not absorbed by said second color filter.

12. (previously presented) The sensor of Claim 1, wherein said third photo-detector element is capable of accumulating charge upon reception of light within a third range of wavelengths and said fourth photo-detector element is capable of accumulating charge upon reception of light within a fourth range of wavelengths.

13. (original) The sensor of Claim 12, wherein said first photo-detector element produces a first color value, said second photo-detector element produces a second color value, said third photo-detector element produces a third color value and said fourth photo-detector element produces a fourth color value, and further comprising:

a third two-color photo-detector having a fifth photo-detector element in an elevated relation with a sixth photo-detector element, said fifth photo-detector element being electrically isolated from said sixth photo-detector element, said fifth photo-detector element being capable of absorbing light within said first range of wavelengths and producing a fifth color value, said sixth photo-detector element being capable of absorbing light within said second range of wavelengths and producing a sixth color value; and

a fourth two-color photo-detector having a seventh photo-detector element in an elevated relation with an eighth photo-detector element, said seventh photo-detector element being electrically isolated from said eighth photo-detector element, said seventh photo-detector element being capable of absorbing light within said first range of wavelengths and producing a seventh color value, said eighth photo-detector element being capable of absorbing light within said second range of wavelengths and producing an eighth color value.

14. (previously presented) A digital image sensor, comprising:

a first two-color photo-detector sensitive to a first total wavelength range, said first two-color photo-detector having a first photo-detector element capable of absorbing light within a first range of wavelengths of said first total wavelength range and a second photo-detector element capable of absorbing light within a second range of wavelengths of said first total wavelength range, said first photo-detector element being in an elevated relation with said second photo-detector element;

a first dielectric layer between said first photo-detector element and said second photo-detector element;

a second two-color photo-detector having a third photo-detector element in an elevated relation with a fourth photo-detector element, said second two-color photo-detector being sensitive to a second total wavelength range different from said first total wavelength range; and

a second dielectric layer between said third photo-detector element and said fourth photo-detector element.

15. (original) The sensor of Claim 14, further comprising:

a substrate, said second photo-detector element being formed within said substrate.

16. (original) The sensor of Claim 14, wherein said first photo-detector element is formed of amorphous silicon having a thickness selected to absorb light within said first range of wavelengths, said second photo-detector detecting light within said second range of wavelengths passed by said first photo-detector element.

17. (original) The sensor of Claim 14, further comprising:

a color filter in an elevated relation with said first photo-detector element, said color filter absorbing light within a third range of wavelengths and passing light within said first and second ranges of wavelengths.

18. (original) The sensor of Claim 17, further comprising:

a transparent metal conductor layer between said color filter and said first photo-detector element.

19. (original) The sensor of Claim 14, further comprising:

circuitry for driving said first photo-detector element and said second photo-detector element, said first photo-detector element being in an elevated relation with said circuitry.

20. (canceled).

21. (canceled).

22. (canceled).

23. (canceled).

24. (canceled).

25. (canceled).

26. (canceled).

27. (previously presented) The sensor of Claim 1, wherein said first photo-detector element is formed of amorphous silicon having a first thickness selected to absorb light within said first range of wavelengths and said third photo-detector element is formed of amorphous silicon having a second thickness selected to absorb light within a third range of wavelengths.

28. (previously presented) The sensor of Claim 14, wherein said first photo-detector element is formed of amorphous silicon having a first thickness selected to absorb light within said first range of wavelengths and said third photo-detector element is formed of amorphous silicon having a second thickness selected to absorb light within a third range of wavelengths.